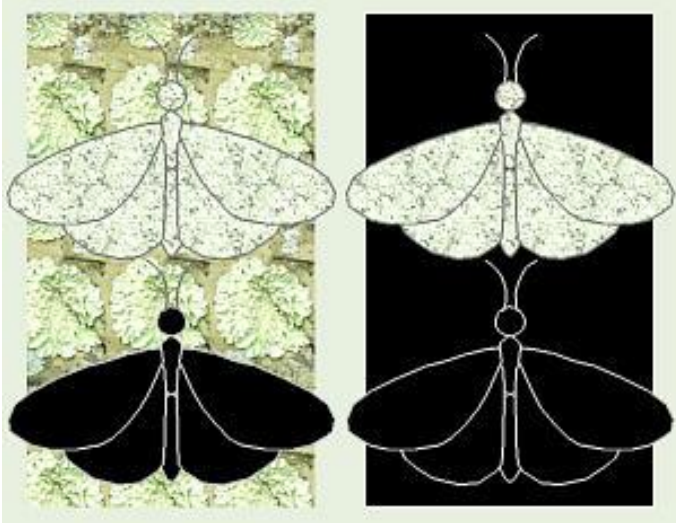


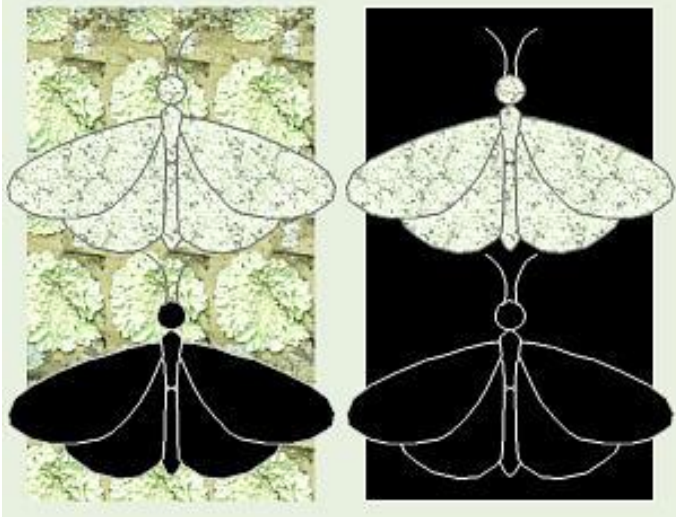
## English Peppered Moths (*Biston betularia*)



One of the best documented examples of natural selection in modern times is the English Peppered Moth (*Biston betularia*). Typically, this moth is whitish with black speckles and spots all over its wings. During the daytime, Peppered moths are well-camouflaged as they rest on the speckled lichens on tree trunks. Occasionally a very few moths have a genetic mutation which causes them to be all black, so they are said to be **melanistic**. Black moths resting on light-colored, speckled lichens are not very well camouflaged, and so are easy prey for any moth-eating birds that happen by. Thus,

these melanistic moths never get to reproduce and pass on their genes for black color. However, an interesting thing happened to these moths in the 1800s. With the Industrial Revolution, many factories and homes in British cities started burning coal, both for heat and to power all those newly-invented machines. Coal does not burn cleanly, and creates a lot of black soot and pollution. Since lichens are extremely sensitive to air pollution, this caused all the lichens on city trees to die. Also, as the soot settled out everywhere, this turned the city tree trunks (and everything else) black. This enabled the occasional black moths living in the cities to be well-camouflaged so they could live long enough to reproduce, while the “normal” speckled moths were gobbled up. Studies done in the earlier 1900s showed that while in the country, the speckled moths were still the predominant form, in the cities, they were almost non-existent. Nearly all the moths in the cities were the black form. It was evident to the researchers, notably Henry Bernard Davis (H. B. D.) Kettlewell (famous for his research on **industrial melanism** in Peppered Moths), studying these moths that the black city moths were breeding primarily with other black city moths while speckled country moths were breeding primarily with other speckled country moths. Because of this, any new genetic mutations in one or the other of those populations would only be passed on within that population and not throughout the whole moth population. Additionally, because the city and country environments were different, there were different selective pressures on city vs. country moths that could potentially drive the evolution of these two populations of moths in different directions. The researchers pointed out that if this were to continue for a long enough time, the city and country moths could become so genetically different that they could no longer interbreed with each other, and thus would be considered distinct species. In this case, what actually happened is that the people of England decided they didn’t like breathing and living in all that coal pollution, thus found ways to clean things up. As the air became cleaner, lichens started growing on city trees again, thus the direction of the selective pressure (birds) was once again in favor of the speckled moths. By now, English cities, as well as countrysides, both have a mixture of speckled and black moths, and all are interbreeding at random, thus were not separated for long enough to develop into separate species.

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